10/505149
DT15 Rec'd PCT/PTO 20 AUG 2004

Claims

1. Container (20, 30) for receiving an aqueous solution, and in particular cells, derivatives of cells, subcellular particles and/or vesicles, which is formed at least partially by an outer limit (21) forming an inner chamber (22, 32) for receiving said solution, and which comprises at least one area which acts as an electrode (25, 26, 33, 34) when an electric voltage is applied and a subsequent discharge occurs, wherein at least one electrode (25, 26, 33, 34) is made of a conductive synthetic material at least based on a plastic material which is doped with at least one conductive substance, and wherein the overall concentration of said dope in said plastic material is 40 – 80 % w/w.

2. Container according to claim 1, wherein said dope consists of carbon fibers, graphite, soot and/or carbon nanotubes.

3. Container according to claim 1 or 2, wherein the overall concentration of said dope in said plastic material is 40 – 60 % w/w, preferably 50 – 60 % w/w, in particular 55 – 60 % w/w.

4. Container according to claim 1 or 2, wherein the overall concentration of said dope in said plastic material is 50 – 80 % w/w, preferably 60 – 80 % w/w, most preferred 70 – 80 % w/w, in particular 74 – 76 % w/w.

5. Container according to any one of the claims 1 to 4, wherein said plastic material is polycarbonate, polyetheretherketone, polypropylene, polyamide, polyphenylensulfide or a mixture of these polymers, or at least based on one or several of these polymers, and/or wherein said plastic material is an intrinsically conducting synthetic material.

6. Container according claim 5, wherein said intrinsically conducting synthetic material is polyaniline, polyacetylene, poly-para-phenylene, poly-para-

phenylensulfide, polypyrroles, polythiophene, polypropylene or the like, or at least based on one or several of these polymers.

7. Container according to any one of the claims 1 to 6, wherein said outer limit (21, 31) is made of synthetic material, preferably transparent plastic material.

8. Container according to claim 7, wherein said outer limit (21, 31) is made of the same plastic material as the plastic material on which said at least one electrode (25, 26, 33, 34) is based.

9. Container according to any one of the claims 1 to 8, wherein said at least one electrode (25, 26, 33, 34) is integrated into said outer limit (21, 31).

10. Container according to any one of the claims 1 to 9 comprising at least two electrodes (25, 26, 33, 34) being made of the same material.

11. Container according to any one of the claims 1 to 10, wherein at least two electrodes (25, 26, 33, 34) are made of different materials.

12. Container according to any one of the claims 1 to 11, wherein at least one electrode (25, 26, 33, 34) is made of polyamide, in particular polyamide 66 or polyamide 6, doped with 25 - 45 % w/w, preferably 30 - 40 % w/w, in particular 33 - 37 % w/w, carbon fibers and 15 - 35 % w/w, preferably 20 - 30 % w/w, in particular 23 - 27 % w/w, graphite.

13. Container according to any one of the claims 1 to 11, wherein at least one electrode (25, 26, 33, 34) is made of polyamide, in particular polyamide 66 or polyamide 6, doped with 30 - 50 % w/w, preferably 35 - 45 % w/w, in particular 39 - 41 % w/w, carbon fibers and 25 - 45 % w/w, preferably 30 - 40 % w/w, in particular 34 - 36 % w/w, graphite.

14. Container according to any one of the claims 1 to 11, wherein at least one electrode (25, 26, 33, 34) is made of polycarbonate doped with 15 - 40 % w/w carbon fibers and 1 - 40 % w/w graphite.

15. Container according to any one of the claims 1 to 11, wherein at least one electrode (25, 26, 33, 34) is made of polyetheretherketone doped with 40 - 50 % w/w carbon fibers.

16. Container according to any one of the claims 1 to 11, wherein at least one electrode (25, 26, 33, 34) is made of polyamide, preferably polyamide 66, doped with 40 % w/w carbon fibers.

17. Container according to any one of the claims 1 to 11, wherein at least one electrode (25, 26, 33, 34) is made of polypropylene doped with 40 % w/w carbon fibers.

18. Container according to any one of the claims 1 to 11, wherein at least one electrode (25, 26, 33, 34) is made of polyphenylensulfide doped with 40 - 50 % w/w carbon fibers.

19. Container according to any one of the claims 1 to 18, wherein said outer limit (21, 31) comprises at least one opening for supplying said solution and at least one opening for draining off said solution.

20. Container arrangement comprising at least two, preferably 6, 12, 24, 48, 96 or more, containers (20, 30) according to any one of the claims 1 to 18 being joined to build one unit.

21. Method for production of containers or container arrangements according to any one of the claims 1 to 20, wherein said container (20, 30) or said container arrangement is produced by two-component injection moulding, wherein at first the outer limit (21, 31) is moulded leaving one recessed window and the conductive synthetic material being made of doped plastic

is subsequently moulded into said at least one window, or wherein at first said at least one electrode (25, 26, 33, 34) is moulded of said doped plastic material and said outer limit (21, 31) is subsequently moulded around said at least one electrode (25, 26, 33, 34).

22. Method for treatment of cells, derivatives of cells, subcellular particles and/or vesicles by means of electric current, in particular for electroporation or electrofusion, comprising:
    a) Transferring said cells, derivatives of cells, subcellular particles and/or vesicles into an inner chamber (22, 32) of at least one container (20, 30) according to any one of the claims 1 to 19 or at least one container of a container arrangement according to claim 20, wherein said container (20, 30) comprises at least one electrode (25, 26, 33, 34) being made of a doped synthetic material, and at least one further electrode (25, 26, 33, 34), and
    b) Applying voltage to said electrodes (25, 26, 33, 34) and generating a current flow in said inner chamber (22, 32) of said container (20, 30).

23. Method according to claim 22, wherein said electric current reaches a current density up to 120 A/cm^2, preferably 80 A/cm^2.

24. Method according to claim 22 or 23, wherein biologically active molecules, in particular nucleic acids, are solved in said solution, and transfer of said biologically active molecules into living cells is achieved by means of a voltage pulse having a field strength of 2 to 10 $kV*cm^{-1}$ and a duration of 10 to 200 µs.

25. Method according to claim 24, wherein said transfer of said biologically active molecules into said cells is achieved by a current flow following said voltage pulse without interruption, having a current density of 2 to 14 $A*cm^{-2}$, preferably 5 $A*cm^{-2}$, and a duration of 1 to 100 ms, preferably 50 ms.